Technological Change and the Scholarly Communications Reform Movement

Reflections on Castells and Giddens

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Reconceiving and reorganizing collection development practices around the evolving processes and products of the scholarly communications cycle has become one of our profession's fundamental opportunities. However, our increasing use of market mechanisms and digital technologies to rationalize the production and distribution of scholarly information poses significant risk that business cycles and the obsolescence of hardware and software will lead to the inadvertent loss of significant portions of our intellectual heritage. This article introduces a theoretical framework for understanding the relationship between academic culture and digital technology as they relate to scholarly communication and library collection development, drawing chiefly on the work of the social theorists Daniel Bell, Manuel Castells, and Anthony Giddens. The article suggests that Castells's theory of the network society and Giddens's account of disembedding, expert systems, and risk as hallmark features of modern society together point us toward a more candid recognition that the fragility of digital systems and the resulting possibility of significant cultural loss are intrinsic features of the new landscape of scholarly communications. Moreover, acknowledging this risk is an important dimension of successful reform of the scholarly publishing system.

Scholarly communication has become a guiding metaphor for academic librarianship, and reconceiving and reorganizing collection development practices around the evolving processes and products of the scholarly communications cycle has become one of our profession's fundamental opportunities (Atkinson 1996, Atkinson 2000). At the same time, however, our increasing adoption of market mechanisms and digital technologies to rationalize the production and distribution of scholarly information—while promising a resolution to the cost crisis in scholarly publishing and bringing us within view of a truly national or international scholarly collection distributed across a network of cooperating repositories—also poses significant risk that business cycles and the obsolescence of hardware and software will lead to the inadvertent loss of significant portions of our intellectual heritage.

The challenges posed by digital technologies for long-term preservation of data and cultural objects have been extensively documented and discussed (see,

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for example, MacLean and Davis 1998). As Donald Waters writes,

> digital information and the technologies on which they depend are extremely fragile. Their fragility makes it highly uncertain that digital libraries can endure over time and it causes one to wonder about the durability of their supposed benefits. Rapid cycles of change and obsolescence infect the hardware and software products now in common use to create new knowledge (Waters 1999, 193–94).

Waters continues: "The challenge of creating the deep infrastructure needed to sustain digital records of knowledge over time consists, at least in part, of marshaling a complex set of political, economic, and technological forces toward the development of a system of organizations that have come to be known generally as digital libraries" (Waters 1999, 195). That is, the solution to the challenge of assuring the continuity of digital information is not just—or even mostly—technological; rather, it is economic and political or, more broadly, cultural. For example, economic models must be created for digital objects that may be used seldom, if ever, but that still assure long-term revenues to cover the ongoing growth and replacement of hardware and software; and governance models must be developed that define rights and responsibilities, facilitate effective decision making, and that can be perpetuated across many institutional generations.

However, less consideration has been given in our professional literature to the question of the effect of technology on the cultural conditions necessary for the preservation of digital information. Scholars such as Lewis Mumford (1934), Harold Innis (1972/1950), Marshall McLuhan (1962), and Elizabeth Eisenstein (1979, 1983) have shown in various ways that representational technologies are not culturally neutral, that the material form of information storage and transmission conditions the practices of scholarly communities. As Eisenstein writes of the new fifteenth-century technology that integrated type molds, moveable type, and the printing press: "As *an* agent of change, printing altered methods of data collection, storage and retrieval systems, and communications networks used by learned communities throughout Europe" (Eisenstein 1983, xiv). Standardization of copies within a printed edition, for example, made it possible "for scholars in different regions to correspond with each other about the same citation and for the same emendations and errors to be spotted by many eyes" (Eisenstein 1983, 51).

These are scholarly practices that we now take for granted but that became widespread only by virtue of a particular form of representational technology. Moreover, Eisenstein points out, one cannot treat printing "as just one among many elements in a complex causal nexus, *for the communications shift transformed the nature of the causal nexus itself. It is of special historical significance because it produced fundamental alterations in prevailing patterns of continuity and change*" (Eisenstein 1983, 273; emphasis supplied). As the academy and the larger society of which it is a part make increasing use of the technologies of digital representation and networked communication, it is worth asking how traditional scholarly practices and the values those practices embody might be affected.

In this article I will introduce a theoretical framework for thinking about the relationship between academic culture and digital technology as they relate to scholarly communication and library collection development, drawing chiefly on the work of the social theorists Daniel Bell (1976), Manuel Castells (2000), and Anthony Giddens (1990). I will argue that Castells's theory of the informational society and Giddens's account of disembedding, expert systems, and risk as hallmark features of modern society together point us toward a clearer recognition that the fragility of digital systems and the resulting possibility of significant loss of scholarly literature in digital form are intrinsic features of the new landscape of scholarly communications. Moreover, acknowledging this risk is an important dimension of successful reform of the scholarly publishing system. Librarians must recognize, in particular, that in initiating or taking leadership for certain reform activities, they are taking this risk on behalf of the scholarly community they serve; to maintain credibility, they must be candid about the nature of those risks. In this respect, the ideal of "seamless access" to information products and services, insofar as it obscures the legal and economic complexities of the scholarly communications system, may inhibit the cultural transformation that will be required to create lasting reform.

Library Collections and the Crisis in Scholarly Communication

Since the publication of *University Libraries and Scholarly Communication* (Cummings, Witte, Bowen, Lazarus, and Ekman 1992), the scholarly communications system has become an increasingly visible conceptual framework within which the traditional practices of library collection development are being rethought. This is for two reasons, at least. First is the budgetary challenge to academic libraries that the report did so much to document and publicize. Increasing output of the scholarly publishing apparatus together with increasing unit costs in scholarly journals far exceed traditional budget allocations of universities to their research libraries. These increases have resulted in a well-publicized drop in the numbers of monographs and journals collected by research libraries (see, for example,

Kyrillidou 2000) and, accordingly, diminished access to this literature by researchers and students who depend on libraries. The effects of cost increases have been exacerbated, moreover, by sharp increases in the amount of published scholarly literature. Projecting from a hypothetical library that in 1980 could acquire all the world's published information, for example, Brian Hawkins factors together inflation in material costs, growth rates in publishing, and average rates of increase in research library budgets to conjecture that "available budgets in 2001 will only be able to purchase 2% of what they had twenty years before" and further that "collections will be archiving something of the order of one-tenth of 1% of the available information" (Hawkins 1998, 135). This sharp constriction of access to the body of peer-reviewed knowledge is variously known as the "crisis in scholarly communication" and the "crisis in scholarly publishing." (Two other dimensions of this crisis, in addition to the increase in unit costs and the increase in production, are the restrictions on permissible use imposed by many of the licenses that govern access to electronic books and journals; and the impermanence of digital information.)

A second reason for this new focus on scholarly communication—and a point perhaps more evident to us now, ten years after the publication of the 1992 report—is that the scholarly communications system itself is in the midst of a change that is unprecedented since its inception in the seventeenth century. If we define the scholarly communications system broadly to include the technological and institutional means by which theories, interpretations, and findings are submitted to the scrutiny of expert disciplinary communities and then critiqued, endorsed, disseminated, synthesized, and archived on behalf of a broad community of teachers and learners (novice and advanced, lay and professional), then the changes embedded in this commonplace observation are wide-ranging. Together with broader social changes in research and higher education, the application of the technologies of digital representation and networked communications to scholarly practice have resulted in broader participation in the scholarly communications process and wider access to scholarly information. E-mail has transformed direct scholar-to-scholar communication, vastly expanding opportunities for discourse and collaboration, particularly for scholars in smaller or more remote institutions. E-print servers have been established by working scholars and have expanded access to prepublished materials that previously circulated in mimeo and photocopy only within select circles. Electronic publication has begun to shorten the time between acceptance and distribution of refereed research. More significant, e-mail, datasets (in textual, visual, numeric, audio, and motion picture formats), preprints, and peer-reviewed work may now all be available in digital form, potentially accessible through a single worldwide network. For the first time, all phases of the life cycle of scholarly work are potentially available to a global audience in an integrated database of knowledge. The potential worldwide social consequences of such expanded access to this body of peer-evaluated knowledge-claims can hardly be exaggerated, whether for facilitating scientific and technical advancement or for fostering cross-cultural understanding. [1]

However, there is also significant risk in entrusting this knowledge to the fragile digital communications system. Although the technologies of digital representation and networked communication have often been seen as offering at least part of the solution for the cost crisis in scholarly publishing (cf., for example, Phelps 1998), such discussions typically give less attention to the equally momentous changes that are also transpiring within the business and organizational infrastructure of the information technology industry. Higher education and the scholarly communications system are connected more tightly than ever before to a network of commercial industries and services whose primary clientele is not necessarily the higher education community. These enterprises include the businesses that create information technology (hardware and software), commercial Internet services, overnight package delivery services, online bookstores, and document suppliers like ingenta (lately UnCover). Used in combination, such services have enabled university libraries to come closer to realizing a long-standing vision of a nationally or internationally distributed scholarly collection in which the responsibilities and the costs for acquiring, preserving, and delivering scholarly information can be shared among many repositories. These services have also significantly empowered scholars to access scholarly information on their own behalf without the mediation of libraries. However, the business environment within which these services exist—in particular, the information technology industry—is highly volatile, exposing the scholarly enterprise to greater risk of disruption than it is culturally prepared for. That is, the information products and services on which the scholarly communications system relies—including publishers, document suppliers, and hardware and software platforms—are increasingly under the control of commercial enterprises for which the opportunity and need to generate profit through competitive innovation increases the likelihood of business failure or product/service obsolescence. This economic volatility is not an accidental feature of the technology—or so I will propose (following Castells) later in this paper. Rather, it is an intrinsic characteristic of the socioeconomic system Castells calls the "network society." The instability and volatility of this system, I suggest, need to be plainly acknowledged in our accounts of the crisis we face in the scholarly publishing system and its prospects for reform.

Market Economy, Academic Culture, and the Scholarly Communications Reform Movement

In his classic 1976 work *The Cultural Contradictions of Capitalism*, the sociologist Daniel Bell argued that to understand our postindustrial knowledge-based society we need to recognize the disjunctions that have emerged among its economy, its polity, and its culture. In his view, these three realms "are ruled by contrary axial principles: for the economy, efficiency; for the polity, equality; and for the culture, self-realization" (Bell 1976, xi–xii). "The techno-economic order," he goes on to explain,

> is concerned with the organization of production and the allocation of goods and services. . . . [Its] axial principle is *functional rationality*, and the regulative mode is *economizing*. Essentially, economizing means efficiency, least cost, greatest return, maximization, optimization, and similar measures of judgment about the employment and mix of resources (Bell 1976, 11).

By "culture," on the other hand, Bell refers to "the realm of symbolic forms." Bell argued that the endless demand within modernist culture for change and innovation has fallen out of step with the limitations imposed by economic realities: "changes in the economy and technology," he writes, "are constrained by available resources and financial cost" while "changes in expressive symbols and forms . . . meet no resistance in the realm of culture itself" (Bell 1976, 34). Bell was specifically concerned with expressive symbols like paintings, poems, and musical composition. However, Bell's analysis can be extended to the situation in academic research and scholarly publishing. That is, a similar disjunction can be said to exist between the academic culture within which symbolic representations of knowledge are produced—books and journal articles—and the economic structure that orders the dissemination of those representations.

The main features of the disjunction between academic culture and the economics of scholarly publishing have been suggested by Stevan Harnad (1995, 1999, 2001, inter alia), Corynne McSherry (2001), and several other writers.[2] Academic culture treats scholarly literature as if it were part of a gift economy: scholars donate their research and their writing to scholarly journals so that other scholars may read it, test it, teach it, and build upon it. Scholarly authors desire that their work be disseminated to as many interested readers—or as many intellectually qualified readers—as possible and that the barriers to readership therefore be kept as low as possible. However, scholarly writing and publishing are not—or are not simply—part of a gift economy. Scholarly literature is also a product in a market economy. Universities and state and federal agencies pay for much of the infrastructure that supports this research, and the literature created by the collective research community is traditionally sold in published form—sometimes for modest amounts of money, sometimes for larger amounts—back to colleges and universities by commercial and noncommercial presses. All publishers must adjust prices and terms of distribution according to market conditions, and commercial publishers will generally adjust prices upward and restrict dissemination outside the circle of paying customers to the extent that law and the consumer market will permit.

Furthermore, the economic relationships between the libraries that are the primary purchasers of scholarly journals and the commercial publishers that have become the primary producers of those journals no longer constitute a well-functioning market. Instead, inelastic demand on the part of libraries has exacerbated the inflationary pressures created by horizontal integration within the publishing industry. Studies conducted by Mark McCabe (1998, 1999) indicate that the "sensitivity of library demand to price increases is very small by normal standards (a 1% increase in price results in a 0.3% decline in subscriptions). Given this inelastic demand, publishers have a strong incentive to increase prices faster than the growth rate of library budgets" (McCabe 1999). McCabe's research also indicates that for journals sold by commercial publishers "prices are indeed positively related to firm portfolio size, and that [corporate] mergers result in significant price increases" (McCabe 1998). Finally, McCabe notes, "even after controlling for the effects of portfolio size and other variables, we still observed a substantial inflation residual" (McCabe 1999).

In response to this deterioration of market function, universities and university libraries have increasingly chosen to stimulate competition in pursuit of lower prices and less restrictive terms of access. The Scholarly Publishing and Academic Resource Coalition (SPARC), which was formed in June of 1998 by the Association of Research Libraries, is one of the most visible examples of this effort. SPARC is a worldwide alliance of research institutions, libraries, and other organizations that encourages competition in the scholarly communications market. Under the SPARC program, member libraries contribute to a capitalization fund that can be extended to not-for-profit scholarly publishers that choose to partner with SPARC. In addition, member libraries agree to select a certain number of SPARC-supported publications for subscription.

The "central idea" behind SPARC's program for reform, according to the SPARC Enterprise Director Rick Johnson, "is that competitive market forces must be unleashed if the status quo [of high prices and restrictive access] is to be challenged. . . . Competition is the one overarching ideology

today that enjoys broad support among the disparate stakeholders in the scholarly communication process, including scientists in wide-ranging disciplines, librarians, administrators, and societies" (Johnson 1999). The logic behind the SPARC initiative, Johnson continues, is that "1) if authors have superior alternatives to existing high-priced journals, they will ultimately move to the outlet that better satisfies their need for both recognition and broad dissemination, and 2) if publishers have market support for bold (but inherently risky) new ventures, they are more likely to make the investment" (Johnson 1999).

SPARC and similar efforts are rational and potentially powerful responses on the part of the scholarly community to an economic crisis that threatens fundamental scholarly values. However, concern about the SPARC strategy may be raised on two related fronts. First, SPARC's leverage is strongest on the consumer side of the market cycle: the libraries that agree to maintain a certain dollar value of annual subscriptions to SPARC products. This is the market component that is most motivated to create change. SPARC has so far had less impact on the producer side of the market, that is, the scholars who supply manuscripts and editorial services to scholarly journals. Without a deeper change in the motivational structures within scholarly culture, the ideology of competition will have limited effect.

At the same time, SPARC's emphasis on digital technology to encode, store, and disseminate the products of scholarship to "improve the process of scholarly communication and reduce the costs of production and distribution" intertwines those scholarly products ever more tightly with software and hardware products and market cycles that will not be stabilized by the competitive pressures exerted by the SPARC community. That is, the cost of the scholarly products and the terms under which they may be used constitute only a part of the challenge we face as a scholarly community if enduring wide availability of scholarship is our primary aim. The encoding schemes, file viewers, and network architecture that are necessary infrastructure for the use of the scholarly literature in digital formats will not be controlled by SPARC's competitive strategies. Indeed, it might be expected that the targets of SPARC's competitive products will be driven to innovate more intensively on the side of technology—forcing SPARC products to match those innovations in turn and thus increasing the economic and technological volatility that threatens the long-term availability of scholarship.

The scholarly community cannot insulate itself from the dynamic technological, economic, and social systems of which it is a part, and the reform efforts exemplified by the SPARC project are necessary and appropriate responses to the crisis in scholarly communication. Indeed, not to respond to market dysfunction and other changes in publishing and access would itself entail significant risk. Nevertheless, the consequences of innovation and market intervention cannot all be predicted, especially in the tightly integrated realm of digital communication, and the associated risks cannot be avoided. However, these risks can be controlled and learned from only if the conditions from which they arise are kept in plain view.

Time, Space, and Libraries: Manuel Castells on the Information Technology Paradigm

Viewing the crisis in scholarly publishing from Daniel Bell's perspective, we can say that it is not primarily technological or even economic, but instead that it is rooted in an academic or scholarly culture that relies on a market economy to distribute its products but that generally disavows the tools of that economy for setting the terms of distribution. Resolution of the crisis, it may be argued, will therefore require a *cultural* reorientation of the academy, cultivation of new scholarly and administrative practices focused on the management of the literature through attention to the consequences of choosing a particular venue for publication or providing peer review and other editorial services. Scholarly authors must recognize that if they choose to participate in a market economy, their actions will have market effects and, further, that as authors they can control some of those effects by selecting publishers according to their economic policies and practices. In similar fashion, libraries have begun to understand themselves as consumers that can exert market pressure on publishers by refusing to buy products whose cost—calculated in dollars or in the obligations or limitations imposed by contractual terms—exceeds use-value.

The cultural and economic realms whose disjunction Bell diagnosed are not entirely separate, of course, and the most visible initiatives in the scholarly communications reform movement may be interpreted as using economic tools to create exactly this kind of cultural change. More specifically, it might be argued that by intervening directly in the scholarly publishing market and creating new journals to compete with titles whose high-price/high-increase histories have created the budgetary crisis—and at the same time exploiting digital technologies that promise to enhance productivity and keep costs low—we are already presenting scholars with a set of choices that will help them recognize their impact on the economic infrastructure of the scholarly publishing system. Moreover, the SPARC-affiliated programs *Create Change* (Create Change 2000) and *Declaring Independence* (SPARC 2000) target the practice of working scholars more directly by providing them with checklists of responsible practices for scholarly publishing and asking them to evaluate the journals in which they publish against those guidelines.

As I have suggested, however, representational technologies are not culturally neutral: the material forms of information storage and transmission condition the cultural practices of the communities that use them. We should therefore expect that in adopting new technologies the traditional structures that have organized scholarly communication in the past will be subject to change. In his seminal three-volume study *The Information Age: Economy, Society and Culture*, the Spanish sociologist Manuel Castells proposes that digital technology has begun to "reshape, at accelerated pace, the material basis of society.[3] Economies throughout the world have become globally interdependent, introducing a new form of relationship between economy, state, and society, in a system of variable geometry" (Castells 2000, 1). In this new socioeconomic construction, according to Castells, the action of knowledge on knowledge—rather than the action of knowledge on raw material or on machines—has become the main source of economic productivity, and the symbolic representation of knowledge thus becomes central to social and cultural change. In this respect, the role of libraries as one of the key mediating institutions for the transmission and preservation of these symbolic representations places them at the center of the information society. However, this same "action of knowledge on knowledge" made possible by digital technology creates unprecedented flux in the technical, economic, and social infrastructure through which libraries perform this role, thus challenging their ability to fulfill their traditional mission and motivating changes in the way the work of libraries is organized.

In this section, I will outline Castells's theory of the relationship between what he calls the "information technology paradigm" and emerging features of early twenty-first-century culture. Castells argues that "the cumulative feedback loop between innovation and the uses of innovation" (Castells 2000, 31) made possible by networked digital technology leads to increasingly rapid product innovation and increasing volatility in business cycles. And because this new economy is based on technologies that represent knowledge and information, Castells argues, we should expect social change as well—the emergence of new forms of social organization and cultural production. Among these changes is a change in the way time organizes the relationships of work, family, and other social groups. This is an intensification, I will argue, of a basic feature of modernity that Anthony Giddens (1990) calls "disembedding," in which social interaction is dispersed across time and space rather than being localized in time and place. In the section that follows, I will connect Castells's work more closely to Giddens's broader theory of the dynamic of modern social systems and the defining place of risk in those societies, and will suggest that the technological and economic structures that define the "information society"—and the knowledge objects bound into those structures—are inherently at risk of dissolution. I will then draw some implications for the practice of librarians and the scholarly communications reform movement.

In the new "informational" mode of development, according to Castells, the source of economic productivity has become the application of technology to knowledge generation, information processing, and symbolic communication (Castells 2000, 17). (A mode of development, in Castells's terms, is the set of "technological arrangements through which labor works on matter to generate the product, ultimately determining the level and quality of surplus" (Castells 2000, 16). By contrast, in an agrarian mode of development, "the source of increasing surplus results from quantitative increases of labor and natural resources (particularly land) in the production process, as well as from the natural endowment of these resources," whereas in an industrial mode of development, "the main source of productivity lies in the introduction of new energy sources, and in the ability to decentralize the use of energy throughout the production and circulation processes" (Castells 2000, 16–17).

What is new in the informational mode of development, Castells explains, is not the kind of activities in which humankind is engaged, but rather "its technological ability to use as a direct productive force . . . [its] capacity to process symbols" (Castells 2000, 100). Thus for Castells what is specific to the informational mode of development "is the *action of knowledge upon knowledge* itself as the main source of productivity. . . . Information processing is focused on improving the technology of information processing as a source of productivity" (Castells 2000, 17, emphasis added). Modes of development shape social behavior, including symbolic communication; and because informationalism is based on technologies that represent knowledge and information, Castells argues, "there is an especially close linkage between culture and productive forces, between spirit and matter, in the informational mode of development. It follows that we should expect the emergence of historically new forms of social interaction, social control, and social change" (Castells 2000, 18).

When we talk about information technologies, we too often think only of digital technology and overlook the complex analog technologies embodied in writing, drawing, printing, and other forms of representation and storage of information and knowledge. Castells argues, however, that the tightly integrated technologies of digital representation and networked (packet-switching) communication make a *specific* difference to the informational mode of development and thereby influence culture and cultural practices.[4]

Castells's analysis thus covers both the economic and the cultural consequences of the informational mode of development and may help us to see how the role of libraries in the preservation and transmission of knowledge

may be changed by these new cycles of technological innovation. On the one hand, Castells argues, information technology is itself now the engine of economic growth: it enables the iterative application of knowledge to improving the technology. In turn, information technology enables the globalization and concentration of capital by creating networks of information that "converge toward a meta-network of capital that integrates capitalist interests at the global level and across sectors and realms of activity" (Castells 2000, 506). High-technology firms depend on those highly concentrated financial resources to sustain their endless drive toward innovation, productivity, and competitiveness; and capital, "acting directly through financial institutions or indirectly through the dynamics of stock exchange markets, [thereby] conditions the fate of high-technology industries" (Castells 2000, 503–4). Manipulation of these financial markets—instantaneous shifts of large sums of capital in response to equally instantaneous communication of changing political and economic circumstances, practices made possible by electronic networks—in turn creates new forms of devastating economic crises, leading to the "wrecking of companies, and of their jobs, regardless of performance because of sudden, unforeseen changes in the financial environment in which they operate" (Castells 2000, 466).

For Castells, therefore, the information technology industry and the larger society of which it is a part are inevitably and necessarily unstable and subject to crisis. "Any attempt at crystallizing the position in the network as a cultural node in a particular time and space sentences the network to obsolescence, since it becomes too rigid for the variable geometry required by informationalism" (Castells 2000, 215). The root of this condition of instability, according to Castells, is the relationship of network technology to time:

> during the 1990s the convergence of global deregulation of finance and the availability of new information technologies and new management techniques transformed the nature of capital markets. For the first time in history, a unified global capital market, *working in real time*, has emerged. The explanation, and the real issue, of the phenomenal volume of trans-border financial flows . . . lies in the *speed* of the transactions. The same capital is shuttled back and forth between economies in a matter of hours, minutes, and sometimes seconds (Castells 2000, 465).

At the same time, Castells claims, the processes of social transformation within the network society go beyond the sphere of social and technical relationships of production and affect culture and power as well. In the network society, "[c]ultural expressions are abstracted from history and geography, and become predominantly mediated by electronic communication networks" (Castells 2000, 507). One of the key categories of cultural expression, according to many social theorists, is the way time organizes work and other social relationships and processes.[5] Lewis Mumford, for example, argues that the "clock, not the steam-engine, is the key-machine of the modern industrial age" (Mumford 1934, 14) for making possible the rational organization and coordination of social and industrial enterprise.

A society structured around technologies of digital networking, Castells claims, is characterized by the breaking down of both the traditional biological and social rhythms associated with the notion of a life cycle and the clock time of industrial society (Castells 2000, 476). He calls this a condition of "timeless time"—a condition that "occurs when the characteristics of . . . the informational paradigm and the network society, induce systemic perturbations in the sequential order of phenomena. . . . Elimination of sequencing creates undifferentiated time" (Castells 2000, 494). Castells argues that

> this is happening now not only because capitalism strives to free itself from all constraints, since this has been the tendency of the capitalist system all along, without being able fully to realize it. Nor is it sufficient to refer to the cultural and social revolts against clock time, since they have characterized the history of the past century without actually reversing its domination, indeed furthering its logic by including the clock time distribution of life in the social contract. *Capital's freedom from time and culture's escape from the clock are decisively facilitated by new information technologies, and embedded in the structure of the network society* (Castells 2000, 464; emphasis supplied).

Similarly, Castells argues, spatially localized *places* are giving way to what he calls the "space of flows." "From the point of view of social theory," Castells explains, "space is the material support of time-sharing social practices" (Castells 2000, 441). In other words, space brings together social practices that are simultaneous in time. Traditionally, this "bringing together" was accomplished by physical contiguity or proximity. In the case of libraries, for example, it has meant that for much of their history one of the motivations for building large comprehensive print collections has been to control the inconvenience caused by spatial dispersion of information-bearing documents; effective access to information required spatial proximity to the documents in which it was embodied.

In the informational mode of development, physical proximity is being replaced by other kinds of material supports for simultaneous social practices—circuits and networks of electronic exchanges and the nodes and hubs that

organize these networks (Castells 2000, 442–43)—and society is increasingly constructed around what Castells calls "flows," purposeful and repetitive sequences of exchange and interaction between physically separated actors in the economic, political, and symbolic structures of society. Capital may be exchanged along these flows as may information, technology, organizational interaction, images, etc. Castells proposes that a "space of flows" is the "new spatial form characteristic of social practices that dominate and shape the network society. . . . *The space of flows is the material organization of time-sharing social practices that work through flows*" (Castells 2000, 442). We can accordingly think of libraries not as individual places or structures but as nodes within a space of information flow, a space in which simultaneous access to information objects is not necessarily accomplished through physical proximity (of the objects or the user).

The upshot, Castells argues, is that networked digital technology is beginning to reconfigure the most basic structures of society and culture. It is important to note that "timeless time" and the "space of flows" are not simply psychological categories, not merely the ways in which some members of the informational society have come to experience their world. Rather, these new organizing principles have material consequences. As I shall argue in the next section, they help to create a condition of standing or intrinsic risk not characteristic of earlier forms of modernity.

From Technological Determinism to Risk Culture: Implications for Library Collection Development

Castells has been criticized for the technological determinism that appears to inform this account of the relation between modes of production (capitalism) and modes of development (informationalism) (cf., for example, van Dijk, n.d.). That is, it may appear from Castells's account that the social and symbolic aspects of our lives are shaped exclusively by the conditions of high technology and late capitalism, that technology is a juggernaut out of our control carrying society to its inevitable destiny (glorious or debased, as the case may be).[6] In this section, I want to propose an alternative interpretation by which Castells's work is read instead as describing a condition of risk that is inherent in the informational mode of development. Under this reading, the deterministic tendency in Castells's account is counterbalanced by Anthony Giddens's concept of reflexivity in the risk society, and the conditions that Castells identifies can be addressed through political or social action.

Unlike Castells and other theorists, Giddens does not treat "informationalism" or "network society" as forms of society that have radically broken with Western modernity. Rather, he considers modernity to have entered a period of extreme intensification, and the "timeless time" and "space of flows" in Castells's account of network society can thus be understood as an extreme condition of what Giddens calls "disembedding," "the 'lifting out' of social relations from local contexts of interaction and their restructuring across indefinite spans of space-time" (Giddens 1990, 21). Disembedding, in Giddens's view, is one of the hallmarks of modern culture:

> The dynamism of modernity derives from the *separation of time and space* and their recombination in forms which permit the precise time-space 'zoning' of social life; the *disembedding* of social systems (a phenomenon which connects closely with the factors involved in time-space separation); and the *reflexive ordering and reordering* of social relations in the light of continual inputs of knowledge affecting the actions of individuals and groups (Giddens 1990, 16–17).

Giddens contrasts the disembeddedness characteristic of modernity with the tighter integration of time and place characteristic of more traditional societies. In premodern societies, he says, "space and place largely coincide, since the spatial dimensions of social life are, for most of the population, and in most respects, dominated by 'presence'—by localised activities. The advent of modernity increasingly tears space away from place by fostering relations between 'absent' others, locationally distant from any given situation of face-to-face interaction" (Giddens 1990, 18).

The various technologies and social practices that create spatial and temporal disembedding—including long-distance communication technologies—have allowed modern bureaucratic organizations such as universities (and also states and corporations) to coordinate the activities of large numbers of people across large regions of space and long periods of time, thus connecting "the local and the global in ways which would have been unthinkable in more traditional societies and in so doing routinely affect the lives of many millions of people" (Giddens 1990, 20). As a consequence, the potential reach of unintended by-products or technical failures of these technologies and practices is greatly magnified in the numbers of people who may be affected and the size of the regions across which the consequences may spread. For example, whereas the tendency of deadly viruses and other biological agents to kill their hosts can be a significant limitation on their ability to spread widely, the high-speed transportation networks that have helped to reduce the effects of spatial dispersion (by reducing the amount of time previously required to move people and products across great distances) are now more likely to disperse those viruses to major population centers.

Giddens thus characterizes the modern condition as one of intrinsic risk, risk that is created by the social practices and technologies of modern life as contrasted with the kinds of dangers presented by life in the premodern world. Moreover, he says, modernity is also characterized by widespread *awareness* not only of the risks we face but also of the limitations of scientific and technical expertise in controlling or resolving those risks. This awareness is an aspect of what Giddens calls the "reflexivity" of modern life (Giddens 1990, 124 ff.). "There is a fundamental sense," Giddens explains, "in which reflexivity is a defining characteristic of all human action" (Giddens 1990, 36). "All human beings routinely 'keep in touch' with the grounds of what they do as an integral part of doing it" (Giddens 1990, 36). With the advent of modernity, however, reflexivity takes on a different character. It is introduced into the very basis of system reproduction, such that thought and action are constantly refracted back upon one another. . . . The reflexivity of modern social life consists in the fact that social practices are constantly examined and reformed in the light of incoming information about those very practices, thus *constitutively* altering their character (Giddens 1990, 38; emphasis supplied).

Not only are social systems constantly evaluated by various groups of experts and laypeople, the resulting reflexive knowledge is itself reflexively used to modify those systems and thus the nature and dynamics of modern social systems. Indeed, in a network society as described by Castells we should expect to see an intensification of that loop of information-modification-information.

Giddens and other theorists of the so-called "risk society" (cf. Beck 1992) have generally focused on threats such as nuclear annihilation, environmental collapse, and worldwide contagion from genetically modified organisms, and have proposed political and social responses appropriate to these dark realities. Castells's account of the fundamental structural role of information in the network society suggests that the fragility of digital networks may pose a risk with similar reach. If the "action of knowledge upon knowledge" is the fundamental source of productivity in the information economy, then threats to the continuing accessibility of the body of validated knowledge are equally threats to the sustainability of this economy. Moreover, we may hope that this body of knowledge also contains the tools necessary for moderating some of the risks that advanced science and technology have helped to create; the loss of that literature would therefore be all the more tragic.

One of the mechanisms that create disembedding in modern societies is the expert system, by which Giddens means "systems of technical accomplishment or professional expertise that organise large areas of the material and social environments in which we live today" (Giddens 1990, 27). Expert systems "remove social relations from the immediacies of context . . . by providing 'guarantees' of expectations across distanciated time-space" (Giddens 1990, 28). Academic research libraries can be understood as a disembedding expert system, as may many other elements of the scholarly communications system. In an academic library, the labor of economic consumption of scholarly literature is divided from the labor of production. Professional librarians take responsibility for the business processes by which the literature that is created by and for the use of scholars is bought and paid for, and also take responsibility for some aspects of the organization and long-term storage of that literature. The principles and processes by which we accomplish this work define our professional expertise.

However, in other ways universities and university libraries still embody to an unusual degree the more traditional "premodern" integration of time and space and of space and place, while scholarly publishing combines aspects of both a traditional "face-to-face" culture and a more abstract market-driven system. As we noted in the previous section, for example, one of the motivations for building large comprehensive print collections has been to reduce the inconvenience caused by spatial dispersion of information-bearing documents; effective access to information required spatial proximity to the documents in which it was embodied, and many of the expectations and practices of academic workers are structured around the local print repository. The crisis in scholarly communications, understood as a cultural crisis, may therefore be traced to the tension between the traditional aspects of scholarly practice—research, authorship, and peer review—and the more modern or abstract systems that result in the pricing and marketing of commercial journals and other scholarly publications.

Until recently (and the establishment of the annual ritual of serial cancellation at most universities) most scholars have not had to directly confront the market behavior of the journals that, as authors and readers, they support. Similarly, most scholars have not had to confront the consequences for themselves and their community of the restrictions imposed by many publishers on the use of scholarly literature in digital networks. At the least, this division of responsibility between librarians and scholars has contributed to the perception on many campuses that inflation, underfunding, and licensing restrictions are a library problem.

If librarians wish to contribute to the resolution of the scholarly publishing crisis, therefore, we may need to return more responsibility for the functions of that system to the scholars who create and consume its products. The *Create Change* program sponsored by SPARC, the normalized pricing studies undertaken by Cornell (Cornell University Faculty Task Force 1998) and the University of Wisconsin (Soete and Salaba 1999), and other efforts on local campuses to inform faculty about the consequences of

publisher practice (cf., for example, Fyffe and Kobulnicky 1999) represent some of the steps necessary for creating a critical self-understanding on the part of scholarly authors and readers—for increasing, as Giddens would call it, the "reflexivity" of the academy, thereby helping to resolve the contradiction between the traditionalist and modernist aspects of the scholarly communications system. However, having taken professional responsibility for much of the apparatus of the organization of scholarly literature and for some aspects of its distribution, professional librarianship has instead helped to block reflexive feedback and the changes in the respective roles of authors and librarians that this might entail.

There are limits, of course, to the degree to which reflexive knowledge—on the part of librarians or that of scholarly authors and readers—can control the changes introduced by new technologies. Resolution of the cost crisis in scholarly publishing will not eliminate the susceptibility of digital systems to technical failure nor reduce the interest of commercial publishers in using mechanisms other than cost to restrict the availability of the intellectual property under their control (restrictive licenses, for example). The new landscape of risk is therefore one with which librarians and scholars alike must become more familiar. Even traditional print-based libraries did not have absolute control over their services; outside forces were always capable of disrupting the delivery schedules of books and journals, and individual copies of printed books and journal issues could always be lost or vandalized. However, as digital networking, fax transmission, and rapid package delivery begin to offer an alternative to local collection development for meeting access needs, the increasing dependence of scholarly communication on these businesses, systems, and technologies weakens the scholarly community's control over the scholarly communications system and leaves it more vulnerable to highly disruptive change. The denser and further flung the network from which the library delivers its services—particularly the scholarly texts and other information for which libraries are the traditional repository—the greater the risk of service disruption. Despite the wishes and expectations of some library users, the reliability of access strategies like document delivery and remotely hosted digital files cannot be guaranteed by the local institution. Indeed, Castells's observations on the relationship between competition in the information industry and the large-scale flows of capital reinforce the common-sense expectation that the volatility of these markets and services will only intensify in the coming years.

As with the costs of scholarly information, however, librarians have tended to mask the volatility of information services in an effort to create "seamless" or "transparent" systems. Instead, I would suggest, it is vital that the faculty and students for whom library services are designed as well as the administrators responsible for funding those services be helped to understand the increased risk and volatility inherent in the transformed scholarly communications network. One of the means by which this awareness can be increased is the collection development policy. In a 1986 paper, Ross Atkinson analyzes the functions of collection policies into referential, generative, and rhetorical functions. The referential function is primary, he said; it "provides a description of the collection's current state, development, and desired direction" (Atkinson 1986, 141). The generative function, in which the policy guides the selector in transforming the collection from its current to its desired condition, and its rhetorical function, in which it provides an argument "that there is a systematic collection plan in effect, and that such a plan is worth pursuing" (Atkinson 1986, 141), follow, he said, from the policy's referential function.

The new conditions of the access library and the crisis in scholarly communications of which these conditions are an aspect argue for a re-ordering of these priorities with greater prominence given to the rhetorical function. The traditional collection development policy needs to be reconceived as a strategically oriented access-development plan guided by the transformations under way in the scholarly communications system. Such a plan should articulate, for each disciplinary program, the roles that local collections, remotely hosted digital files, and document delivery services will play in providing information. Such a plan should also highlight the sources of risk to the short-term and long-term availability of information under these models, as conditioned by rising costs, access restrictions imposed by owners of the intellectual property, volatility among the key publishers, etc. In the unstable state in which that system currently finds itself, the rhetorical function of the access plan therefore takes on greater importance. The stability, rationality, and predictability of information markets on which a "systematic collection plan" would be founded are not ours to claim, and it is vital to our credibility that we articulate the limits of our control over information services.

The stakes for libraries, if they are to remain an integral part of the scholarly communications system, are high. As Giddens points out, "Widespread lay knowledge of modern risk environments leads to awareness of the limits of expertise and forms one of the 'public relations' problems that has to be faced by those who seek to sustain lay trust in expert systems" (Giddens 1990, 130). However, while the existence of risk poses a threat to the credibility of experts, it is worse for an expert community to be discovered to have concealed risk or to have ignored it altogether:

> The faith that supports trust in expert systems involves a blocking off of ignorance of the lay person

> when faced with the claims of expertise; but the realization of the areas of ignorance which confront the experts themselves, as individual practitioners and in terms of overall fields of knowledge, may weaken or undermine that faith on the part of lay individuals. Experts often take risks "on behalf" of lay clients while concealing, or fudging over, the true nature of those risks or even the fact that there are risks at all. More damaging than the lay discovery of this kind of concealment is the circumstance where the full extent of a particular set of dangers and the risks associated with them is not realised by the experts (Giddens 1990, 130–31).

Conclusion

One of the functions of social theory is to help bring about new ways of viewing familiar phenomena. When an abstract story is created about the details and complexities of everyday social practices, new connections may be revealed between areas not previously seen as connected. In this paper, I have attempted to draw connections between the reform efforts currently under way in the areas of scholarly publishing and scholarly communication, on the one hand, and theories of the emerging shape of risk in societies structured by information technology and networked communication, on the other. I have suggested that risk of loss of scholarly knowledge be understood as an intrinsic feature of digital information technology, not as an accidental limitation that will eventually be overcome; and that some of the efforts currently under way to reform the scholarly communications system may increase that risk by increasing the instability of the scholarly publishing market. I have argued, moreover, not that we should seek to avoid risk, but instead (the risk being unavoidable) that these risks need to be made clear to the scholarly communities served by librarians, and that greater responsibility for the choices presented by evolving information services should be returned to the scholarly community that creates and uses the scholarly literature. There is significant risk for librarians, I concluded, in accepting risk "on behalf of" the community we serve, unless those risks are clearly explained and articulated.

Making such adjustments to the division of scholarly labor created by the modern bureaucratic university will not come easily or quickly. There are clear benefits to this division that we should wish to preserve. However, we should also expect that the changes under way in the emergence of the "network society" or "information society" will include the traditional roles and relationships of scholarly authors and academic librarians.

Notes

1. Compare Lewis Mumford (1934) on the historic impact of the experimental method in science:

> the most important invention of all had no direct industrial connection whatever: namely, the invention of the experimental method in science. This was without doubt the greatest achievement of the eotechnic phase [Mumford's term for the handicraft technology prior to the industrial revolution]: its full effect upon technics did not begin to be felt until the middle of the nineteenth century. The experimental method . . . owed a great debt to the transformation of technics: for the relative impersonality of the new instruments and machines, particularly the automata, must have helped to build up the belief in an equally impersonal world of irreducible and brute facts, operating as independently as clockwork and removed from the wishes of the observer: the reorganization of experience in terms of mechanical causality and the development of cooperative, controlled, repeatable, verifiable experiments, utilizing just such segments of reality as lent themselves to this method— . . . None of the inventions that followed the development of the scientific method were so important in remolding the thought and activity of mankind as those that made experimental science possible (Mumford 1934, 132–33).

2. Harnad argues that scholarly authorship is properly part of a gift economy and must therefore be carefully distinguished from commercial authorship which is part of a market economy. Copyright protections are appropriate for the latter, he says, but not for the former. Harnad therefore proposes that scholarly publishing be reorganized around a system of freely available open-access archives of scholarly literature. McSherry, by contrast, emphasizes the close ties between university funding and the commercial marketplace. Even so, they are both skeptical—at least with respect to academic work—that "the natural compensation for creative work is property ownership" (McSherry 2001, 26). For further discussion of the relationship between universities and the commercial economy, see Slaughter and Leslie (1997).

3. For a useful critical overview of Castells's trilogy, see Stalder (1998).

4. Castells focuses specifically on digital (binary) schema for representing knowledge objects and on packet-switching as a communications protocol. However, most features of his analysis would stand if digital representation were replaced by some other system and if (when) other communications protocols emerge. What is fundamental to Castells's analysis is any representational schema that can integrate multiple sensory modes into a common high-speed communications channel.

5. I have here reversed Castells's order of exposition. In contrast to most social theorists, Castells considers space to be a more fundamental organizing principle than time. For the purposes of this paper, however, the point is not crucial.

6. For an overview of historical determinism, see Smith and Marx (1994). Feenberg (2001) offers a useful antideterminist theory of contemporary technology and society.

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